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Report of the Washington Meeting

As in previous years *The American Biology Teacher* is devoting most of one issue to a report of the annual meeting. This month we print several of the papers in full or nearly so, together with summaries or abstracts of some of the others. Some of the details of election and other business have already been reported; some other papers or summaries of them are still to be printed.

WHAT PART CAN BIOLOGY PLAY IN HEALTH TEACHING?

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The title of this paper demands some explanation. What do we mean by biology? And what do we understand by health?

Biology is the study of living things. In our schools it deals primarily (1) with the natural relationships of living things, and (2) with their structure and behavior in what seem to be the most satisfactory conditions for their life and reproduction at present.

By health, we understand that general condition of the organism that is most conducive to its satisfactory living and to its reproducing its kind in its reproductive period.

It is obvious that the study of biology cannot help but play some part in the transmission of information and the development of attitudes concerning human health. Just how great a part it is playing at present is questionable since that depends largely upon the spirit in which the subject is taught and studied. . . .

A biologically-minded person does not expect to be happy, comfortable, and successful always. He knows that happiness, comfort, and success are not continuously normal for any living species including his own, and consequently, he is able to accept discomfort, disease, and misfortune as normal attributes of living. Since we are presumably all biologists, it is needless to elaborate this point, and I shall proceed by attempting

to answer certain expected questions, the first of which may well be,—How can the biological attitude be made more prevalent?

Psychologists tell us, and I think we all agree, that attitudes are set in the early years of life. For that reason then, I should say that the biological attitude may be made more prevalent by the following efforts on the part of adults:

1. By the continuous expression and implication to the young that the process of living in man has much that is identical with the process of living in other animals, in that
   a. life begins as a single cell bearing cytoplasm, a nucleus, and chromosomes,
   b. traits are inherited by way of the genes,
   c. growth occurs by cell division,
   d. differentiation into tissues, organs, and systems takes place,
   e. metabolism including nutrition, circulation, respiration, and elimination of wastes goes on
   f. coordination between nerve cells, muscles, and glands is continuous,
   g. inherited traits are affected in their expression by environment,
   h. two sexes are usual,
   i. reproduction of the species occurs,
   j. death is the end of the life of the body.
2. by the continuous expression and implication to the young that mankind is only one of the million or so species on this earth, every one of which is equally active in its struggle to carry on the processes mentioned above.
3. by the continuous expression and implication to the young that mankind has no more fundamental right to inhabit the earth than any other one of the thousands of species extant at this time.
4. by the continuous expression and implication to the young that every species including mankind has a fundamental right to improve conditions for itself if it can; that is,
   a. if one species is parasitized by another, it has a right to annihilate its parasite if it can,
   b. if a species can protect itself against its enemies, whether it be by muscular strength, immunization, or some other means, it has a right to do so,
   c. if a species can increase its range or its food supply, it has a right to do so.
5. by the continuous expression and implication to the young that in spite of what has just been said, there is such a thing as a "web of life," the excessive disturbance of which may bring disaster to one or more species.
6. by the continuous expression and implication to the young that while all of the foregoing statements are true, man is different biologically from the other animals in the development of the fore-part of his brain; and that because of this difference he has more power to change his living conditions than any other animal, and therefore great responsibility to present man, to his posterity, and to all the other species.

A second question that might arise is: Who can be expected to impart the biological attitude? Since attitudes are set in the early years of life, it follows that those who are most influential in developing attitudes are those adults who have the most to do with the young, namely, parents and teachers in schools.

Let us consider those two groups of adults. At present, few parents are biologically-minded. All know that they put food in at one end of the baby and that solid wastes emerge from the other end, but what goes on between is to most something of a mystery. Not much can be expected of parents in their present state of enlightenment in the way of deepening biological understanding in their children.

But what of the teachers in the schools? Since the teachers as a group were reared by unbiologically minded parents and taught by unbiologically

minded teachers, what sort and what depth of biological attitudes do they possess? It is fairly safe to say that most teachers are no better off and in many cases probably not as well off biologically as the parents.

We have spoken of teachers in general or of most teachers; now what of a certain group of teachers, namely those of us who deal with biology? We would certainly appear to be the logical ones to inculcate the biological attitude. But we have limitations too. In the first place, most of us were reared and taught by unbiologically minded parents and teachers. Secondly, many of us know but fail to live our biology. The fact, however, that we are at present teachers of biology means that we once had and probably still have an original curiosity about life in the realistic sense, and also that we have probably done something to ourselves in the way of developing a biologically sound attitude towards living. It probably means further that with some conscious effort on our part we can be more positively biological in our own living and teaching. We can recognize that we ourselves and the youngsters under our tutelage are continually responding to biological stimuli, wanting to eat, to drink, to play, to exercise, to eliminate waste, to avoid or to mingle with the opposite sex depending upon the age level, to select mates through our senses, to have children, to do everything that the other animals do in addition to some things that the other animals do not do. Frank recognition and acceptance of these fundamentally biological urges is a tremendous step towards healthful living, and it seems to me that of all the adults with whom the young come in contact, the teacher of biology is at present best fitted to inculcate such recognition and acceptance. We as teachers of biology are subject to another limitation in that as a rule we do not teach children at a sufficiently early age. This fact works a hardship on present boys and girls, but it need not continue to affect future generations if we do a sufficiently good job with our present pupils. For most of them will in an incredibly short time be the parents and teachers of another generation.

If then by our own living and teaching, we biology teachers continuously express and imply to present boys and girls that they themselves began as single cells, grew by cell division, differentiated into bone, muscle, blood, and nerve cells, that they at present eat hamburgers and ice-cream and convert them into their own substance, that they coordinate nerve and muscle on the dance-floor or on the athletic field, that they are either male or female, that they are wanting or will want to select mates and have babies, and that they will at length die and make food for other organisms; if we express and imply to them that in the view of any Creator, organic man is on a par with sparrows and with dandelions; if we express and imply that everything alive has a right to seek the environment that it needs; if we express and imply that if man can annihilate the mosquito. it is right, and if the mosquito can annihilate man, it is right also, if man can develop a drug to cure gonorrhea it is right, and if *Neisseria gonorrhea* can develop an immunity to man's drug, it is right also; if we express and imply that if only corn is grown in the Middle West, the nitrate bacteria will suffer and so will man; if we express and imply to these boys and girls that because of the development of their frontal lobes they have power to improve their own lives and their species by intelligent mate selection and rearing of progeny; if we do this kind of thing, we, the teachers of biology, shall be answering a challenge long felt but little

heeded; and we shall be instrumental in increasing human happiness and effective living.

CURRICULUM DEVELOPMENT IN SCIENCE*

1. *Does science education receive enough attention in our schools?*

It seems rather obvious that it does not, although members of the panel emphasized that *additional* teaching should not be of the traditional kind but should emphasize problem solving and be more in accord with the psychology of child development.

2. *Where does science instruction need strengthening?*

It needs strengthening throughout, but particularly where it is taught in a formal and traditional manner. Teacher training institutions were believed to be at fault for much of the "academic" teaching. There was some conflict of opinion concerning the relative places of generalized science instruction with modern applications and a battery of specialized science groups.

3. *Is science education being related to living?*

The panel differed somewhat in opinion. One member said that science teachers know the proper forms of words but do not *do* what the words mean. Another panel member believed a great deal of application was being made in some schools and that there should be more planning of the science curriculum *with* students.

4. *Should there be a science curriculum for general education?*

There was general agreement that there should be and that science and science teachers should be related more closely to the program of the entire school and the problems of the community.

5. *Is the science program finding and developing science talent necessary for research and industry?*

Members of the panel and audience pointed out that the present program is somewhat deficient in these respects. There was emphasis on the failure of some science teachers sufficiently to recognize individual differences of students or to meet the needs of the public.

6. *How can science teaching better meet needs of children, communities and nations?*

The panel believed there is no single way to do this but that an important aspect is to be able to measure or evaluate the effect of science teaching on the students and on the public. Such evaluation or measurements would indicate ways to improve science teaching.

7. *How can problems solving be taught best in science courses?*

The panel did not suggest any single method for achieving this result.

8. *What should be the relationship of senior high school science to junior high school and elementary science?*

The panel believed there should be coordination in science teaching among the various levels. There seemed to be agreement that an evaluation of the entire science program was imperative in many local schools and perhaps over wide areas. Perhaps, like the New England farmer who was reluctant to adopt progressive methods of farming recommended by the county agricultural agent, some science teachers like

* Panel Discussion—December 28, 1948, ANSS, NABT, NCES, NSTA, Resume' presented by Dr. Edgar Fuller, United States Officer of Education, Washington, D. C.

teachers in other fields, "Ain't farming as good now as they know how."

THE ROLE OF THE BIOLOGIST IN HEALTH TEACHING*

1. The biology teacher has a trained background, including such subjects as:
   - science
   - hygiene
   - anatomy
   - bacteriology
   - sociology
   - psychology
   - parasitology.
2. The biology teacher knows how to accept community resources as aids to biology. These may include contacts with:
   - health departments
   - clinics
   - hospitals
   - water supply
   - sanitation
   - food preservation
   - recreational facilities.
3. The biology teachers and departments of biology have already accepted much of the health program as indicated by units on the following subjects:
   - mental hygiene
   - dental hygiene
   - disease
   - nutrition
   - reproduction
   - sex hygiene.
4. Biology teachers can make pupils, parents and communities more health conscious.
5. Biology teachers can survey and coordinate the health facilities of the schools and can instigate health councils.

* Outline of a panel discussion on the biology teacher and curriculum, December 28, 1948, submitted by RUTH A. DODGE, President, N.A.B.T.

THE WASHINGTON PROGRAM

The program of the Washington meeting of NABT, much of which is reported in this issue, is a good example of cooperative activity. As might be expected from the fact that health was the general theme of the meeting, many of those who contributed papers and served on committees are not teachers, but workers in some other phase of the promotion of health or in the more fundamental studies of health itself.

George M. Lyon, M.D. is a Special Assistant for Atomic Medicine and Chief of the Radioisotope Section of the Research and Education Service of the Veterans Administration, Washington, D. C. Dr. Lyon took an active part in World War II as a Safety Advisor and Special Representative and was decorated by the President for his work. He has written many articles in the field of medicine and is one of the leaders in the application of atomic energy to medicine. George B. Dowling, M.D., Deputy Administrator of the National Blood Program, was recently retired from the Navy Medical Corps with the rank of Rear Admiral, after 30 years of service. For his work during World War II he was recommended for the Legion of Merit, received two citations from the King of England and the Distinguished Service Medal. He is a fellow of the American College of Physicians and holds membership in many outstanding medical societies.

The other authors of papers in this issue are teachers. Mrs. Phyllis Cook Martin teaches General Biology, Human Development and Behaviour, and Marriage Education at Pennsylvania College for Women at Pittsburgh. Mrs. Martin holds the degree Ph. D. from the University of Illinois. John E. Shoop has been a biology teacher in New Rochelle High School for the past 25 years. He has contributed papers to *The American Biology Teacher* and other journals of science education, is co-author of a laboratory manual—*Key Experiments in Biology*—and is an active leader in various activities associated with health education and promo-

(*Continued on page 88*)

THE IMPLICATIONS IN A BLOOD PROGRAM

GEORGE B. DOWLING
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If man can make machines better than himself, can he not make himself better? This poses a problem to the biologist, whose first concern should be man.

The World Health Organization repeatedly emphasises the necessity for a greater understanding of the needs of man, his response to environment, injury, and disease, and the factors that influence his resistance and recuperative power.

Such an understanding as a means to human welfare has been an eternal quest of mankind. The specific problems posed have long been recognized, but to a large extent we have not conquered them. We have continued to yield our annual toll in death and disability, comfortably reassured by the tremendous advances of the last century that fuller knowledge will be ours in due time. Then came the war. . . . Under the biting stimulus of the struggle for survival, research in both the science and art of medicine was speeded up to a pace hitherto unknown to us. Even so, in this push button age of science, we still lag far behind on the one supremely important item—the man who must push that button.

You, as a group of educators, are in a most strategic position to play an increasingly important part in making and interpreting discoveries destined to save thousands of lives. Let me tell you how. By supporting the World Health Organization and the millions of world citizens working under the Red Cross banner, with these objectives in common, namely: the promotion of health, the prevention of disease, and the mitigation of suffering throughout the world.

The program I represent, the National Blood Program of the American Red Cross, gives everyone an opportunity to contribute directly to the saving of life and the prevention of disease—a most humanitarian ideal. Through the blood program, many of you may carry out that ideal in the concrete act of fellowship—giving of your blood. In addition, you have much more to offer your fellow man. Your chosen profession, biology teaching, is the science dealing with the study of life. Thus your research and investigation will help provide some of the answers to our problems. And, in addition, you can interpret this program to others.

You biologists are undoubtedly familiar with Red Cross participation in the field of blood procurement for the ill and injured. However, with your indulgence, I shall briefly review how and why the Red Cross is participating in this service. Our initial step in recruiting donors was taken in 1937 when we supplied a list of volunteer blood donors to an obstetrician in Augusta, Georgia, for his post delivery hemorrhage cases. This type of service was so effective that it extended to other Red Cross chapters. Then came the war when the American citizenry, through the Red Cross, supplied over 13 million pints of blood to the Armed Forces. With the cessation of hostilities the program for the Armed Forces terminated. Nevertheless there was a recognition on the part of many medical authorities that our peacetime need for blood would soon equal or surpass the wartime needs.

An analysis of some of the factors that contribute to our peacetime needs may be of interest.

In 1947 accidents took a toll of nearly

a hundred thousand killed and ten million injured, at a cost to the nation of 6.7 billion dollars. During the war there were 55 times more people injured in civilian life than on the battlefield. This alone is a motivating factor sufficient to justify this blood program.

Your obstetrician knows that a woman in childbirth may lose as much as two quarts of blood—one-third of her total volume—and that unless this is replaced in a matter of minutes she will die. Your surgeon will testify to the need of blood before, during, and after serious surgery, particularly lung surgery. He will tell you about a gallbladder case of 10 years ago, before blood was available, when the patient would come to surgery in a desperate condition and the operation, if successful, would leave him a semi-invalid for many months. Today's patient, because of blood given before the operation, is an excellent surgical risk, because of transfusions during the following surgery his convalescence is short and he is back at work in a few weeks.

Miracles are performed with the use of blood in pediatrics. Any physician who has watched the little ones snatched from death by the use of blood has no doubt about its place in modern medical practice. For both young and old, burn cases, highway accidents, numerous other conditions bring about a need for blood that justifies the service we are now undertaking.

There is no thinking person following the news day by day who can fail to recognize that we are far from peace, far from the recognition of the dignity of man, far from the real concept of the brotherhood of man. On the thirteenth of November our newspapers stated *"Official Planners Tonight Urge Quick Action on Vast Scale to Defend Americas Millions Against Atomic Bombing, Poison Gases, and 'Secret Weapons' of the Unknown Future."* The National Blood Program is an agency through which blood could be provided in case of such emergency. . .

The objective of the National Blood Program is to make available to the nation a continuous supply of blood sufficient in quantity to meet peacetime needs as well as be prepared for the impact of disaster or national emergency. To accomplish this objective we are establishing a chain of regional blood centers supported by mobile units.

The centers are strategically located for procurement and distribution of blood. To procure the peacetime requirements estimated at 3.7 million pints of blood per year, we are developing regional centers as rapidly as orderly planning and operating permit provided that the following criteria are met: (a) a local need for blood, (b) the local Red Cross is capable of carrying out its responsibilities concerning the program, and (c) that it is desired and approved by the local medical society and the hospital and health authorities.

The Rochester Regional Blood Center was the first regional center in the National Blood Program. On January 12 it will have its first birthday. To date we have established a total of 19 regional centers and by June 30, 1949, we anticipate a total of more than 30 centers in operation.

Despite the problems inherent in an undertaking as important as the blood program, sustained cooperative effort on the part of Red Cross chapters, medical societies, hospitals, public health authorities, and groups such as yours has given the undertaking lively impetus.

At the beginning of December the program embraced 234 counties, involving the participation of 400 chapters and serving more than 600 hospitals.

While the quantity of blood collected so far is only a small percentage of present nation-wide need, it does indicate

that with mobilization of all community forces the Red Cross will, in time, reach its objective of supplying much of the blood needed in medical practice. The motivating force is the need of the people for blood. Only the generosity of all persons in donating their blood will provide the power to drive this program forward with sustaining momentum.

It is clear, then, that our first great task must be one of education and inspiration. The American people are invariably generous when a cause is worthy and well interpreted. It is up to all of us to explain the great need for blood in contemporary medical practice and its importance to the health and welfare of the American people. You can help us accomplish this by participation with the American Red Cross and teaching profession in the development of curricular materials in the form of lesson plans, outline of study, and suggestions for methods of teaching about blood and blood derivatives. This will form a body of material that may ultimately be made available to the teaching profession throughout the nation for instructing our young people in every school grade, kindergarten, through college, concerning this important subject. It is felt that, to be acceptable, such materials must be developed by the teaching profesion, which is to use them, with such aid from the American Red Cross as is needed.

In developing teacher committees to study the problem, the wise school group will seek members, not just biology teachers, chemistry teachers, health, social science, or general science teachers, but representatives of all these groups, including curriculum specialists. They will consider the story of blood as it develops in the mind of the child from kindergarten throughout the entire school life, through many subjects of study and school situations. Thus, the whole story may be told and the school curriculum will give an intelligent picture of the vital importance of blood in the health, the saftey, and the well being of the community of today and the years ahead. . .

World health depends to a great extent upon all nations being able to live harmoniously in a total changing environment—the ability to live harmoniously with other traditions, other religions, and other social systems throughout the world.

There is no idealogy or theology upon which all men agree, but there is today one ideal that is common to all men of good will—humanitarianism. And that ideal is represented in the banner under which all men may serve without doing violence to their patriotism or loyalties —national, religious, or racial—under the banner of Red Cross, which symbolizes good will, humanity, love to all who behold it wherever it flies. It was this philosophy that prompted the Board of Governors of the American National Red Cross to accept the challenge of a National Blood Program which will furnish a continuous supply of blood sufficient in quantity to meet the needs of peace and provide for the impact of national emergencies.

When reviewed in its proper perspective, the National Blood Program has tremendously broad implications; it is important locally, nationally, and internationally.

First, it is a community program because it serves the blood needs of your community. Its technical aspects are under the guidance of your local medical society, represented by a group of physicians selected by them to make up a medical advisory committee. Your blood program committee provides local administrative control. It is being proved that your resource of volunteers within the community will contribute blood and

give unstintingly of their time. Your regional blood center acts as the agent through which you donate blood for your loved ones.

Second, your regional blood program is a *unit in the many such programs which make up the national program.* In this manner you help to provide for local disasters or national emergiencies whether man made or God made. As the coverage widens you will be assured that you and your loved ones will receive blood wherever and whenever needed within the confines of the nation, a service that will be available when the national program is fully developed. Other national services that will play important parts in the future are (a) the fractionation program and (b) encouraging and stimulating research through the provision of those many identified but comparatively unstudied derivatives of blood that will be made available without cost to the research workers of our nation.

Third, the program is important internationally, for the American Red Cross Blood Program is working closely with Red Cross programs in other countries. At the XVIIth International Red Cross Conference held in Stockholm last August, the Red Cross societies of five other nations conducting similar programs submitted reports. The significant contributions made by these societies to world health prompted the passage of a resolution by the International Conference encouraging Red Cross Societies to assume vigorous leadership in developing national blood programs.

Examples of international cooperation under Red Cross auspices in the blood field are already numerous. A Red Cross Benelux agreement provides for the pooling of blood collected in Belgium, the Netherlands, and Luxembourg in the event of an emergency in any one of the participating countries. Meanwhile the Belgian Red Cross is processing all blood collected for the Luxembourg Red Cross peacetime needs. The third partner to this agreement, the Netherlands Red Cross, acting in an advisory capacity, is sharing the experience which it gained in this field during the Nazi occupation, when its blood program was established through the use of equipment stolen from the Nazis by the Dutch underground. When the Italian government decided last year to organize a National Blood Collection Program in Italy that would extend to every province, the Red Cross was asked to direct the program. Dr. Lapponi, Medical Director of the Italian Red Cross, spent 2 months with the American Red Cross last summer studying the technical methods and new developments in the blood field preparatory to assuming this responsibility. At the same time, Dr. Spaander, Director of the Netherlands Red Cross Blood Program, was in the United States also on an American Red Cross study visit and was thus enabled to share with Dr. Lapponi the knowledge and experience of his society.

With blood programs already under way in Norway, Finland, Denmark, Spain, Canada, Australia, and Peru, and with new programs beginning in Chile, Brazil, Uraguay, Iran, and Greece, the possibilities for international collaboration are limitless. Study is even given to the standardizing of equipment to facilitate this cooperation on a worldwide basis.

Any national program that has for its objective the preservation of health, the prevention of disease, and the mitigation of suffering deserves to be interpreted to the nation. Your association is a steering committee for the man and woman of tomorow. You have the ability, the knowledge, and the opportunity of interpreting the National Blood Program to

tomorrow's donor who is still under your guidance. For this is not merely a program of today, but of today, tomorow, and the long future ahead if we wish to help promote a healthy, happy, prosperous, and secure nation through this great humanitarian venture. And let's not forget that despite world insecurity and social unrest, science has reaffirmed that all mankind are blood brothers.

RADIOISOTOPES IN BIOLOGY AND MEDICINE

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Radioisotopes in Biological Investigations

There is a widespread interest in the peacetime application of the benefits of atomic energy. In very large measure this centers around the use of radioisotopes in medicine and biology.

Atoms of the same element which have different weights are called isotopes. Some isotopes are stable and do not possess the property of radioactivity. The hydrogen in "heavy water" is an example. It may be used as a tracer in stable isotope methodology. Some isotopes are unstable and therefore radioactive. These are commonly referred to as radioisotopes. Radiophosphorus (P^{32}) is an example. It is used in radioisotope tracer methodology.

While some radioisotopes are found in nature, our interest centers around those that are produced artificially in machines like the cyclotron or as a consequence of nuclear reactions within an "atomic energy" pile.

Because the radiations emitted by a radioelement produce ionization they are described as ionizing radiations. Because they are associated with nuclear reactions they are said to be nuclear radiations.

By means of various devices it is possible to detect and measure the radioactivity of the radioelements. . .

In each radioelement there are three characteristics of particular importance to the user, (1) the form of radiation (alpha, beta or gamma), (2) the energy of the radiation (expressed in electron volts or million electron volts) and (3) the rate of radioactive decay or disintegration (expressed in terms of "half-lives"). . .

Effects of Radiation on Tissue

The biologic effects produced by gamma rays, beta particles and alpha particles are qualitatively similar. The same is true of the biologic changes produced by x-rays and neutrons.

The destructive action of nuclear radiation upon living organisms is due to the ionization which it produces within the tissues. Such variations as may be observed in the action of ionizing radiations are due to the differences in penetration and to differences in density and amount of ionization within the tissues. We do not understand clearly the actual mechanism of the destructive effects of ionization upon living cells.

Adapting the Techniques of the Physicist to Biological Problems

The biologist can employ the methods of the physicist in the detection and measurement of radioactivity.

In adapting these methods to biologic studies there are at least three important considerations. (1). The instrument or method used for the determination of the radioactive material in biological samples must be capable of giving quantitative results when the samples are weakly radioactive. (2). The equipment must permit the measurement of large numbers of samples within a reasonably brief period of time since many radioisotopes have short half lives. (3). The apparatus must be sufficiently simple and dependable so as to permit satisfactory and reliable operation by individuals who have not had extensive training in physics or electronics.

Instrumentation

With the exception of the use of photographic film techniques and a few special methods, all devices used for detecting radiation are based upon the ionization which the radiation produces in a gas.

Because the radiations from radioelements render air a relatively good conductor of electricity, it is possible to utilize this phenomenon in the detection and measurement of radioactivity. While there are many different types of instruments designed and used for this purpose, they can be divided roughly into two main groups, (a) ionization chambers and (b) counters.

The simplest type of ionization measuring instrument is the gold leaf electroscope.

The Geiger counter is the most sensitive of all instruments for the detection and measurement of beta and gamma rays The essential element is a device called a "counter tube". It detects the presence of the radiations and makes possible the quantititative measurement of the radioactivity.

The counter tube usually consists of a copper cylinder within which a fine tungsten wire is stretched centrally in a position corresponding to the axis of the cylinder. The wire and the cylinder are enclosed in a glass envelope and the system is evacuated to approximately one tenth of an atmosphere. Various gases may be substituted for air. A potential of about 1000 volts is applied, the positive being connected to the central wire and the negative to the cylinder. When gamma rays or high speed particles enter the counter tube, ions are formed. The negative ions or electrons are attracted by the positively charged wire and the accompanying phenomenon results in a sudden surge of charge equivalent to the flow of a small electric current along the circuit. It can be amplified by electronic counter circuits so as to operate a radio loud speaker or a suitable recording device. It can be made so sensitive as to measure one to many thousands of particles or rays per second entering the counter tube. It gives a single electrical response to each ionizing radiation which enters the tube. The response is always of the same magnitude regardless of the character of the radiations. Because a single "ion pair" will produce such an effect this type of instrument is most valuable in detecting and measuring weakly ionizing radiations. When beta rays are to be measured the walls of the glass envelop must be sufficiently thin to admit them. In tracer work the counter tube is often in the shape of a small bell jar, with a thin mica window at the base in a plane at right angles to the central electrode and the outer shell. This permits the radiations of low penetrating power to enter the ionization chamber.

For detecting and measuring the radioactivity of radioisotopes in biological and medical uses, the Geiger counter tube is the one most important element of instrumentation. . .

"Tagging" With Radioisotopes

By the use of radioelements it is possible to "tag" or label a specific batch of atoms.

The process of "tagging" elements is exemplified by the use of radiophosphorus (P^{32}). This radioelement, usually in the form of soluble sodium hydrogen phosphate is usually given by mouth. It may even be incorporated in the food. It may be given intravenously. The amount given is so small that it does not constitute a significant increase in the intake of phosphorus and it exerts no disturbing influence on the phosphorus metabolism of the body. The radioactive phosphorus atoms behave chemically like ordinary phosphorus atoms. They will go wherever the ordinary phosphorus atoms go. At the same time because of the radioactivity, their presence within the body can be detected, their position identified, concentration measured and movement in, or from the body observed. In this particular instance because they go where the ordinary phosphorus atoms of the food go, they trace the path and movement of the normal phosphorus atoms of the food within the body.

An example of more complicated tagging is the synthesis of the compound diiodofluorescein with radioactive iodine. Here although the molecule is larger and relatively more complex, the presence or movement of the tagged molecule can be observed as long as it retains its chemical identity and contains the radioelement. Such a preparation is of particular value in making blood volume studies because the diiodofluorescein stays in the blood stream much longer than the simple phosphorus or sodium atoms. These tend to leave the blood stream rapidly and to pass into the body fluids.

An example of still more complicated "tagging" is the "in vivo" preparation of erythrocytes "tagged" with radioiron. When radioactive iron is given by mouth, or intravenously, it finds its way into the body iron stores. In the synthesis of the hemoglobin and the formation of erythrocytes these stores are called upon to provide the iron. The radioiron is utilized in the same manner as ordinary iron. Because these erythrocytes contain radioactive iron they can be identified, even when removed from the body of the subject and subsequently given in transfusion to someone else.

The use of radioactive sulphur to "tag" vitamin B_1 and penicillin and of radiophosphorus to "tag" the virus of the tobacco mosaic disease are three additional examples of rather complex "tagging" manoeuvers which have been successfully carried out.

Long-lived radiocarbon (C^{14}) has been used in the synthesis of carbohydrates in an ingenious combination of chemical and biological trickery. Its use in human beings, however, presents serious difficulties from the standpoint of the risk which would be incurred by introducing such a long-lived radioelement into the body. Many other radioisotopes that would be useful from standpoint of their particular chemical nature are quite unsatisfactory for biological or medical research because of the characteristics of their radioactivity.

In this connection one has to consider not only the nature of the radioelement itself but as well the nature and behavior of the compounds into which the element might be formed. If the radioelements or radioactive substances tend to selectively accumulate in certain parts of the body this selective localization may give rise to a significant internal radiation problem. It is known that the behavior of radiophosphorus within the body in the form of soluble sodium hydrogen phosphate is different

from that of the radiophosphorus of an insoluble compound such as chromic phosphate. The former goes wherever phosphorus atoms go. The latter goes only where the insoluble particulate in which it is incorporated may go. Here its physical rather than its chemical characteristics are significant. Chromic phosphate, when suspended in an aqueous solution and injected into laboratory animals, tends to settle out in the reticuloendothelial system. The highest concentrations were found to be in the liver, spleen and bone marrow.

Tracer Techniques

Radioautographs. Radioautographs are made by placing sections of the specimen to be studied against a sensitive photographic film and permitting it to maintain this contact until a sufficient time has elapsed for it to take its own picture. Beta emitters usually give better results than gamma emitters. By this method the topographic distribution of the radioelement within the specimen is readily demonstrated in graphic fashion. Quantitative measurements of radioactivity are not usually made by this method.

Examples of this technique are the demonstration of radioiodine in excised thyroid tissue, of radiophosphorus in lymph nodes, of radioactive krypton gas in perirenal fat and spinal cord (phospholipid) and of radiostrontium in bone. During the war the penetration within the skin of mustard gas "tagged" with radiosulphur and lewisite "tagged" with radioarsenic was demonstrated by this method.

"In Vivo" Methods. The "in vivo" method is employed to trace the dynamic patterns of metabolism and to localize a radioactive material in a particular tissue, organ, gland or tumor through the demonstration of localized radioactivity. The increase in counting rate observed as the counter tube approaches the radioactive material permits the outlining of the site of localization and gives some indication as to the concentration of the radioelement at that site. Counter tubes can be so constructed as to permit their introduction within body orfices or at operation. As a general rule it is necessary to employ radioisotopes which emit gamma radiation for "in vivo" tracer studies. In exceptional instances beta emitters may be used providing the tissue to be studied can be brought close enough to the counter tube.

Outstanding examples of this method are (1) the use of inorganic radioiodine in the study of iodine uptake in the thyroid gland, and in locating those metastases of carcinoma of the thyroid that readily take up iodine and (2) the use of diiodofluorocein in locating some brain tumors. Other examples are the use of radiosodium in the study of peripheral vascular disease and the use of "tagged" iodinated protein in blood volume and circulation time studies.

"In Vitro" Methods. The "in vitro" method is the one most widely used. Specimens of tissue, body fluids, excreta et cetera can be suitably studied in this manner. It has the advantage of being suited to both beta and gamma radiation. The specimen is weighed, dried or ashed and the radioactivity measured in a shielded counting device. Great care must be taken in preparing the specimen for counting and in its proper positioning with respect to the counter tube. Wet preparations are as a rule less satisfactory than dried ones. Details to be watched are avoidance of distortions from scatter effects, from selfabsorption in the case of a beta emitter, and lack of uniformity of the dried counting sample. Even exhaled air can be studied by the "in vitro" method through introducing the air into a

specially designed counting chamber. Quantitative measurements of radioactivity can be made quite satisfactorily by this method.

Examples of this technique are the measurement of radioiodine in the urine and excised tissues, and the measurement of the radiophosphorus in the urine, blood serum, saliva and sweat.

Applications In Biological Research

In 1923, Hevesy, a Danish scientist, was the first to employ a radioiostope in a biological investigation. He used radiolead (radium D) to study the metabolism of lead in plants. He was able to detect the radiolead by determining its radioactivity. This method was at least a million times more sensitive than ordinary chemical or physical methods then available. It had the advantage of permitting a metabolic study of lead in quantities that were so small as to be non-toxic to the individual organism.

Similar study was later made with radiobismuth (radium E).

Both radiolead and radiobismuth are natural radioisotopes. They are not found normally in living tissues and are not applicable to human tracer studies.

Artificial radioactivity was discovered in 1934 by Curie and Joliot. As a result of the development of the cyclotron and later the nuclear reaction pile, there are available to us today a great many radiosotopes of elements which are found normally in living tissue. While a considerable number of these radioisotopes are suitable for use as tracers in biological or medical investigations, a great many of them, for one reason or another, are not.

It is possible to "tag" practically all of the elements with radioisotopes.

In 1935 Hevesy employed artificial radioactivity in the form of radiophosphorus to study the distribution of this element in the body of the rat. This was the first such application of a man-made radioisotope.

By 1944, 21 elements had been "tagged" and used as radioactive tracers in metabolic studies. More than 1000 isotopes are now known. The majority of them are radioactive.

There have already been published several hundred articles and many books dealing with the use of radioisotopes in biological and medical sciences. They are of great value because in the main they represent exercises in tracer methodology, and as such have served as a necessary prelude to later progress in this field.

In the field of biological and medical research radioisotopes have been used (1) in studies of human physiology and biochemistry in both normal and abnormal states, (2) to search for radioelements or radioactive compounds which may accumulate in pathological structures, and (3) in investigating the toxicology of radioactive elements and compounds.

In the field of clinical medicine radioisotopes have been used, (1) in clinical diagnosis and (2) in the treatment of patients. . .

Organization For Radioisotope Work

It is almost impossible to do very much work with radioisotopes in clinical application without the formation at the working level of a radioisotope team. The minimum requirements for such a team are a physician qualified in the human application of radioisotopes, an individual qualified in nuclear physics or radiobiology and an individual qualified in biochemistry. When there are available specialist consultants to supplement the activities of such a team then very nice work can be done. It is only exceptionally that a single individual can be so thoroughly qualified

in all three of the fields indicated as to do the kind of work desired and to properly look after the welfare of the individual patient to whom these radioactive materials may be given.

Need For Formal Safety Plan

In order that no individuals may receive injurious exposure to radiological hazards it is most desirable that there be drawn up in formal fashion for each hospital or laboratory in which radioisotopes are employed a sound health physics or radiological safety plan. It is possible to make compliance with such a safety plan a matter of second nature and it need not be burdensome to anyone. Fortunately by the adoption of suitable yet rather simple measures for safety it is possible to house the medical radioisotope laboratory in a hospital or building also occupied by other personnel. The low levels of radioactivity which are ordinarily employed in biological and medical work generally make this possible.

THE DEVELOPMENT OF PROPER EMOTIONAL ATTITUDES IN SCHOOL CHILDREN

JOHN E. SHOOP
New Rochelle High School, New Rochelle, New York

A recent issue of a current news magazine makes the following statements: "Few Americans are aware that more than half a million men, women and children in the United States are in mental hospitals. Another estimated seven millions, although at large, suffer from some kind of mental illness. Most of these people are perfectly harmless. In fact, if anything they are too passive, too frightened, too beaten, too withdrawn to compete with the harsh brutal reality of modern life. It is for that reason that they wrap themselves in a protective cloak of unreality. They have committed mental suicide."

If proper facilities and agents had been available to recognize their symptoms in the early formative period of their lives, many of these people would now be engaged in gainful occupations and happy in competing with their neighbors; engaged in raising families and occupied with improving social conditions; active in the health and welfare of their community and not a burden on the world.

"When an individual is refused the right to love or hate, to obey or to compete, to play or to exchange ideas, then he erects barriers which keep him isolated." When this happens the individual is filled with a sense of failure which is the first step toward mental ill health.

In order to avoid this first step, the forces of the community must be called into active participation to educate its citizens to recognize and where possible to modify the causes. The three main forces are the home, the church, and the school.

A child's reactions are based on his past experiences, molded by his present circumstances, and influenced by his desires and hopes for the future. Since a child's past experiences are primarily formed in the home under the guidance of parents, we must look there to find adjustment of the individual toward successful living. Because within his family he will develop adjustment patterns that are basic to the individuals whom he meets within his sphere of activity, present and future. It is within the home,

because of its intimate relationships, that he gains a desirable understanding of individual rights and responsibilities, and the use and abuse of authority. It is the family which must direct the individual's active life in its formative period. Here the child will experience his first joys and sorrows, enthusiasms and disappointments, his successes and frustrations. It is to the home that he will turn when he needs comfort and encouragement, solace and love.

Some of the basic emotional patterns that will lead him to an unhappy home life are anxiety, loneliness, fear, guilt, and jealousy. With the development of these patterns immediately arises in the mind of the child a method of escape. It is in this escape that he tries to recapture the happy state of his early life, thus shutting out the grim realities which surround him. It is from these escape patterns that the child creates defense weapons which help him to ignore in part the conditions which have made him unhappy. When these defense weapons lead him into undesirable emotional outlets such as crying, attention seeking, over-aggressiveness, hoarding, temper tantrums, carelessness, flight, then he develops behavior problems.

Since the home plays such an important part in the emotional life of the child, it is the duty of parents to begin their own training before the advent of the child so that they may recognize and direct these emotions into desirable channels. In order to achieve this goal the community, either through its educational services or health department, should institute courses in child psychology, family relationships, sex hygiene, nutrition and child care. These courses should be free, and easily accessible to all prospective parents, and their importance should be made evident by extensive campaigns through newspaper publicity, health agencies, and the local parent-teacher organizations. For those prospective parents who cannot thus be reached because of language difficulties or religious beliefs, their respective churches could institute a similar program and they would gain confidence and respect for the information disseminated and at the same time it would be in keeping with their ideals and spiritual background.

With the birth of the child problems may arise which are beyond the perception of the parent because the parent may have been the cause of the development of the child's complex due to inattention, financial conditions, resentment, incompatibility or divorce. When this condition exists another agency that might be instrumental in the solution of the problem is that of the Child Guidance Center. This agency is staffed by trained psychiatrists, psychologists, psycho-therapists, etc. Active cooperation and regular attendance of the parents is usually essential. The guidance center treats children with such behavior or emotional adjustment problems as chronic anxiety, nightmares, temper tantrums, over-aggressiveness, and fear. Upon admission to the Center a psychological examination is given to the child to determine his emotional problem and its treatment. Treatment may be individual, or in a group, or both, utilizing modern play techniques and art therapy. There are also individual and group treatments for the parents, where their mutual problems are discussed under the guidance of a trained psychologist. If the child's behavior problem is deep-rooted, it may require prolonged and regular contact between the child and parent and the guidance center.

Closely correlated with the schools and with the parents of the students in school should be an active Parent-Teacher As-

sociation. This group should be progressive, dynamic, and cooperative to see that needed improvements are provided for the welfare of the children. They should keep the members of the community informed on the latest developments in education and provide needed speakers, movies, lectures, and reading material on current problems of value to their children.

In New Rochelle such a group exists. With the approval of the Board of Education it has already provided two outstanding programs for P. T. A. members and other interested citizens along the lines of child development and mental hygiene. These programs were called "Community Institutes" and lay members and well-known authorities in the field discussed such topics as "Today's family shapes tomorrow's children," "The Adolescent Child," "Intelligence, its growth and Measurement," "Training for Adulthood," "Boy-girl Relationships," "Rivalries in the Family," "Your Child from One to Five." In connection with the discussions, motion pictures were shown, such as "Emotional Health," "Emotional Development in Children," "As the Twig is Bent," "Feeling of Rejection." Approximately fifteen hundred parents have attended each of these Institues. It is from these sources that the parents are able to supplement their previous knowledge and thus become able to reduce the emotional upsets within the family group. This P. T. A. group has also formed classes for parents in adolescent psychology, the understanding of sex and family relationships. These classes have been unusually well attended.

The church, too, guides the standards and attitudes of children, because it is regarded as the organized agency whose chief responsibility it is to oversee their spiritual development. Many children at an early age are troubled by thoughts of death, by a deep sense of guilt, by some sex act which they have thought or experienced, by conflicting racial and religious beliefs. Generally children's religious concepts are confused and distorted due to their mental immaturity and because of their unquestioning adoption of the religious patterns set up by adults. These emotional experiences become so complex that the ordinary lay mind is not competent to cope with this type of emotional behavior. Because of his position and function the religious leader may become a great asset in the emotional training of the child. Their complete trust in their pastor will lead many children to discuss freely with him the social and moral problems which arise in their immediate environment, and thus the leader may help them to develop a sound philosophy of living and a strong sense of security. Since the religious leader is less likely to be considered an intruder in family affairs, his suggestions in relation to personal actions will be favorably regarded. The minister, in turn, in order to merit the confidence of his parishoners, must be able to approach their problems psychologically. He must be competent to deal with such problems as marital difficulties, emotional instability of parents, behavior problems of children, adolescent conflicts, etc. He must be mentally mature himself.

In order to create a willingness on the part of the people to go to the minister for advice, churches are offering discussion courses in the fields of social hygiene and pre-marital information. Generally these discussions are on different age levels, to attract as many people as possible. Some churches bring in eminent speakers on sex and family relationships and have established pre-marital clinics

within the parish where prospective parents may secure needed advice before and after marriage. In so doing they develop a continuous and ever-growing program which keeps the parent alert to the emotional problems of the child as they arise.

Since emotional difficulties will arise in the mind of the child concerning his own religion and that of others, many churches advise their classes to visit churches of other denominations, in order to become familiar with the basic religious concepts held by other groups. It then becomes the duty of the Sunday School teacher to discuss with his group the history, objectives and customs of each denomination visited. This creates a better understanding and real tolerance of all religions in the mind of the child. In this connection it has been found helpful to have the students read and discuss such books as "One God," "The Church Across the Street." "Religion in the 20th Century."

Out of racial and religious differences may grow discrimination, which creates great emotional problems in children and adults, particularly of the minority groups. Throughout the country understanding people have banded themselves together under the name of the "Council for Unity." Their purpose is to create a better understanding of the problems of minority groups, and to arrest where possible emotional upheavals due to feelings of inferiority, rejection, discrimination, frustration and jealousy. The Council makes the public aware of the existing problems by sponsoring lectures on philosophy, methods and techniques of inter-cultural education; by holding prize essay contests in the public schools based on such topics as "What Unity Means to America"; by advancing outstanding members of minority groups to positions of honor and responsibility in the community; by creating better housing and working conditions for underprivileged groups; by distributing pertinent literature among public school children. Thus recognizing the ever-present problems of racial and social discrimination by frank and open discussion of them results in removal of the tension in the minds of members of minority groups.

As the child leaves the home and enters school he begins a training for adulthood. Many of the basic patterns established in the home must now be modified and changed to fit the child to an increasingly complex environment. As he progresses through school new needs and new social demands are created, as well as new skills and work habits, to fit the child for a new type of competition. With this competition comes the urge to be first; to be a part of a group and at the same time to be accepted and admired by the group. In striving to satisfy each of these desires, the child may develop fears, frustrations or hostilities in himself or in others.

Throughout the elementary school the teacher, who has the child in her care all day, and observes him in all types of activity, should be trained to detect any unusual behavior problems in their inception. The ordinary behavior problems can be solved by a conference with the parent. Any emotional block which arises from a physical or mental disability should be referred to the specialized teacher of health or to the department of testing and guidance, where measures will be taken to adjust the child's activities to his abilities, capacities, and interests. Thus he will be given a chance to compete and succeed and will attain a sense of mental satisfaction and security as a result.

Permanent record cards should be kept for each child to follow him throughout

his school career. One card should contain material concerning his scholastic achievement, mental testing record, and behavior and personality patterns, with suggestions and comments by each teacher. Another card should contain health data concerning the child's physical handicaps and their correction, illness, growth and nutrition charts. To these may be added a third card concerned with the guidance and achievement of the student in the high school. The information on these cards will be of untold value to the teacher in adjusting his personality and the subject matter of his course to meet the needs of the individual students.

In New Rochelle the school system operates on the seven-five plan. In the eighth and ninth grades the students attend the academic high schools where they have the advantages of a wide choice of exploratory coures and a variety of extra-curricular activities. This gives them an opportunity to explore and develop their interests and skills so that they can make a wise choice of their scholastic pattern for later life. In the 8th and 9th grades also they are given a battery of tests to determine their aptitudes, which enable the guidance counselors to advise them wisely in their choice of courses and schools for further study. The school therefore creates conditions which will lead the children to want to go to school because of the growing satisfaction which they gain from their classroom experiences.

To take care of the individual differences and interests of the students there are two types of high schools for students in the 10th, 11th and 12th grades—the academic and the vocational. Those students who go to the vocational high school are primarily prepared for immediate employment after graduation, and while attending school are given in-service training in various types of jobs. An important part of their training is given in the personality courses. Miss Miriam Cressey of the Albert Leonard High School has organized a course called "Personality Development," which includes the following topics: Applied psychology, which is primarily concerned with learning how we became as we are; understanding of the people with whom we work, and getting along with our associates; Personal appearance, which includes the understanding of the basis of pleasing appearance, learning how to make the most of our looks, good grooming, developing poise and self-assurance; Manners and etiquette—learning the what and how of good manners, giving opportunities for practicing good manners in various situations and circumstances; Creating a cultural background, with the objectives of understanding why cultural background is important in business; becoming acquainted with some of the means of attaining a cultural background such as music appreciation, correct type of moving pictures, literature, art, etc. In addition to the personality development course there is also a health program which allows the students to participate in the discussion of adolescent problems and in this way prepares them for correct social development in the school and for family participation in later life.

Connected with the vocational high school is a placement bureau where employers apply for students to fill temporary or permanent positions. This permits the counselor to place a student in a job immediately, with an opportunity of following up to ascertain his success or failure in that line of activity. From time to time the counselor calls in the student on the job for conference, to assist him in those points which need adjustment.

Since the academic high schools are primarily concerned with preparation of the students for entrance into college or other professional schools, it becomes their duty to prepare the child with the least possible emotional upset.

Specialized teachers who hande guidance and counseling work become the clearing house for all the activities in which the student will participate during his high school career. Immediately it can be seen that this counselor has a picture of the entire child and thus is able to pass on to the subject teacher, and to others interested in his education, information concerning his health, physical defects, mental ability, emotional blocks and weakness. For example, the program of the student with a heart condition is adjusted so that all his classes meet on the first floor and thus he will be freed from anxiety and fear that his classmates will know of his physical weakness. Likewise, the child who has a hearing defect will be placed in the front of the classroom where he can read the teacher's lips without making his disability apparent to others. Through the testing program the counselor groups the students according to their abilities and interests so that they may achieve success in equal competition, thus eliminating frustration and feeling of failure. In the case of students whose history shows emotional instability, they can be placed with teachers who have understanding and sympathy and are able to direct the children into worthwhile behavior patterns.

This department is also concerned with extra-curricular and social activities, so that the students will develop a well-rounded program and learn the wise use of leisure time both for their immediate needs and for the future. Sports, dances, music, dramatics, and clubs are some of the extra-curricular activities offered by the academic high schools. More than thirty-five extra-curricular clubs are in session throughout the year, sponsored by teachers and self-directed by the students. These clubs tend to give opportunity for more students to develop leadership, since no student is allowed to elect more than two clubs in any one year. Participation in clubs gives the students experience in working together and helps to develop social graces, self-expression and self-confidence, as well as creating cultural patterns.

One of the newer clubs which is concerned with emotional problems is called the "Know Yourself" club. It is open to tenth graders and is divided into two sections, one for the boys and one for the girls. Its purpose is to provide a discussion group for adolescent problems, and from time to time motion pictures are shown to supplement the discussions. At the initial session of the club students handed in question which they would like to have brought up. Some of these questions were:

"How can you tell if a girl likes you?

"Where does necking stop and petting begin?

"Why do parents pay less attention to the second child?

"Why do men of forty or older look for young girls?

"Can you get a venereal disease from just kissing someone who may have it?

"Why are some people more popular than others?

"In a girl's adolescence what causes her to have trouble with her parents?

"My father doesn't take an interest in me. What should I do?

"Do the interests a woman has during her pregnancy affect her baby?

"Why do my neighbors who have brown hair have red-headed children? No one in the family has red hair.

"Why does a woman have twins?

"Should a boy and girl of high school age discuss sex problems with each other?"

Many emotional problems are developed in the biological history of boys and girls. This frank and open discussion provides them with a clear understanding of themselves and their development, helps them to realize that sexual interests and urges are normal, and gives them help in directing their emotions wisely.

Another approach to this area of work is through the biology course. The biological approach is necessarily a slow one, because it concerns itself with three factors—structure, terminology and function. By a close study of lesser animals and their functions the scientific terminology of sex becomes part of the adolescent's vocabulary and thinking, and when the study of the human body is reached it is accepted without surprise or resentment. The lectures, correlated with lab work, bring out such topics as reproduction, heredity, genetics, and hormone study. In this way students are better prepared for accepting parenthood and other responsibilities of adult life. When the preadolescent child emerges into adolescence, the facts which he learned in biology make the change-over gradual and acceptable, and it occurs without emotional disturbance.

The complete personality development of the child requires that he have a satisfactory relationship both with his classmates and with his teachers. The teacher is quick to recognize any emotional block which occurs between a student and other members of the class, but she is not always able to recognize a teacher pupil conflict of which she may be the cause. She therefore becomes an emotional block to the satisfactory adjustment of the child in the class situation.

Teachers cannot hope to assist students in the development of proper emotional attitudes unless they themselves are free from emotional disturbances. It becomes the duty of the administrator, therefore, to recognize and correct the factors which may make the school atmosphere emotionally unhealthy. He must see that commendation is given to the teacher for his accomplishment so that he has a feeling of self-confidence. The wise administrator will find something to commend in the work of every teacher. The teacher must also be accepted and feel that he is a member of the group. All teachers should be given an opportunity to participate in the creation of policies which affect them as teachers. This develops a feeling of unity and cooperation, as well as a feeling of accomplishment. If efficiency and mental alertness are to be sought, then overloaded programs and an abundance of paper work must be abolished, so that the teacher will have adequate time to devote to his students. A teacher must have a salary comparable with that of other professional people of his community in order to have financial security and a feeling that his job is an important one. He should feel free to engage in community activities of his choice outside of school, such as politics, fraternal organizations, service clubs, etc. He should also be freed from work after school so that he has an opportunity to meet other members of the community socially. There should be a liberal sick leave policy for teachers, and generous retirement provisions, because fear of disability through illness or age creates tensions within the teacher which impair his efficiency in the classroom. A grievance committee should be formed to act as intermediary between the administration and the teachers. Mere expression of the grievance releases tension, and a feeling of justice is engen-

dered by having the right and opportunity of appeal.

To watch a bewildered, unhappy child change into a well-adjusted, confident adult is reward enough for the efforts we have expended in his behalf. But the results of our labors do not end here. For the child of today becomes the parent of tomorrow, and his emotional attainments will dominate the thinking and determine the actions of future generations.

NEW APPROACHES TO THE TEACHING OF MAMMALIAN REPRODUCTION

H. O. BURDICK
Alfred University, Alfred, New York

Teachers of high school and college biology now have available new techniques and demonstration materials for teaching reproduction in mammals. By using living mice in the laboratory and the photomicrographs shown at this Conference, the whole reproductive process can be readily shown to students. These demonstrations show the various stages: ovulation (liberation of the egg from the ovary), fertilization, cleavage stages of the fertilized eggs, passage of the eggs or early embryos through the oviduct (fallopian tube) to the uterus, attachment of the embryo to the uterine lining, embryonic growth and development of the mice until the time of weaning.

These structural changes are correlated with those hormones of the anterior pituitary gland and the ovary which are concerned with ovulation and the maintenance of pregnancy. It is also relatively easy to induce ovulation in the diestrous mouse by the subcutaneous injection of pregnancy urine of humans, or a commercial extract of this material.

Some of the photomicrographs shown at this meeting for the first time were obtained while working on various endocrinological problems supported by research grants from the American Philosophical Society, National Research Council and the American Medical Association.

CONSERVATION CARAVAN

Next June, as school vacations are starting, there will be seen along the highways and byways of western New York a traveling School of Conservation known as the Conservation Caravan. Though distances covered will not be great, much variety of scenery and many kinds of natural habitat will be seen. Students will obtain a practical introduction to ecology as they explore in turn open woods in limestone areas, steep escarpments, open fields, streamsides, sphagnum bogs and the "rich woods, north" of Gray's Manual of Botany with their heavy stands of beech, birch, maple and Hemlock, their orchids and other plant rarities. They will visit sanctuaries, nature trails, school gardens and camps, county forests, state parks, beaver dams, hatcheries, farms and a commercial fishery.

Sponsors of the Caravan are the Buffalo Museum of Science and the Conservation Forum of New York State. Co-directors and full time instructors will be Ellsworth Jaeger, Curator of Education at the Museum, naturalist, author, artist and lecturer, and Miss Mabel H. James, field naturalist, research associate in conservation for the Museum and chairman of the Conservation Forum. Both, their many followers will testify, are thoroughly at home in the field and are enthusiastic exponents of outdoor education. Miss James served on the teaching staff of Audubon Nature Center, Greenwich, Conn., last summer.

Specialists of the Soil Conservation Service and of the State Conservation Department are among the many individuals, services and organizations whose volunteer aid will greatly enrich the ten-day course of study. Evening meetings in various com-

munities will afford students and the nearby public opportunity to see and hear the best of conservation movies and visiting experts as well as get a summary of each day's educational achievement. Soil and forest conservation, stream management, birds, flowers, animals, insects and trees will be studied outdoors, with follow-up discussions later.

How are the practical difficulties and problems of the Caravan to be met? The plan is this: students will travel in private cars, each driver having from one to perhaps three passengers, whose privilege it will be to buy the needed gasoline and oil. Overnight stays will be in homes in villages where arrangements are previously made with a garden club or other organization for comfortable lodgings and breakfast at moderate cost. The cooperating club will provide a place for an evening meeting and make needed arrangements for lunches and dinners.

But what about the weather? That the sponsors will not try to arrange, but they will give to prospective students explicit directions as to equipment required for keeping comfortable and entirely independent of the weather.

As an initial venture the sponsors offer this ten day Conservation Caravan from June 29 to July 8, 1949, confident that it will fill a very real educational need. Teachers, students, schol administrators and other adults are invited to enroll at once. Costs will be kept to a minimum. Not more than 20 students can be accepted. Address Conservation Caravan, Buffalo Museum of Science, Buffalo 11, N. Y.

Fee for instruction and all living expenses will be $50, of which $10 is to be paid on registration, the remainder June 15. Fee will be returned if student is not accepted.

REGIONAL CONFERENCE ON PREMEDICAL EDUCATION

A Third Regional Conference on problems of premedical education is being sponsored by *Alpha Epsilon Delta,* national premedical honor society, in cooperation with Syracuse University at Syracuse on May 6 and 7, 1949. Students and faculty representatives from colleges and medical schools of New York and Pennsylvania are invited to meet at the Onandago Hotel for two days of informal discussion. Arrangements for the conference are under the direction of Dr. Hugh E. Setterfield, professor of anatomy, School of Medicine, Ohio State University, and national president of Alpha Epsilon Delta, with the assistance of Dr. Eric H. Faigle, associate dean, College of Arts and Sciences, Syracuse University, national vice-president of Alpha Epsilon Delta, and the New York Beta Chapter at Syracuse University.

The general session on Friday afternoon, May 6th, will be devoted to the problems of education for medical service. Three speakers will introduce the discussion of the following: (1) Basic philosophy and objectives; (2) Content of premedical education—sciences, social sciences and humanities; (3) The evaluation of results—intellectual, social and emotional. A dinner will be held on Friday evening, following which a prominent educator will give an address on "Spiritual Values in Education for Medical Service."

The session on Saturday morning, May 7th, will be devoted to the problems concerning the unpromising and the rejected premedical student. This will be discussed from the point of view of (1) Early selection and guidance of such students, (2) Whether more medical schools are the answer to this problem, and (3) A suggestion of the various ancillary medical services as alternate careers.

Ample time will be reserved for discussion from the floor so that all premedical students and advisers will have an opportunity to present their questions and problems. The final subject for discussion will be an address on the problems of integrating premedical and medical educational efforts.

Further information regarding the conference can be obtained by writing to Dr. H. E. Setterfield, College of Medicine, Ohio State University, Columbus 10, Ohio.

Many biological supply houses can provide marine aquarium supplies, making it possible for students far inland to observe live salt-water plants and animals. Photo by John Breukelman.

Maintaining A Salt Water Aquarium

PHILIP H. POPE
Whitman College, Walla Walla, Washington

Several years ago the writer published an article on *Bringing Marine Animals to an Inland Laboratory*[1] in which he undertook to show the advantages of exhibiting living animals to the students as well as giving the experience of seashore collecting to the few major students who could be taken on the trip.

The most serious drawback encountered (besides the time and expense involved) was the heavy mortality that occurred within the first 48 hours after we got our prizes installed in jars and aquaria in the laboratory.

To meet these problems we have done some experimenting, with the cooperation of a Seattle supply house[2] and have found the results satisfactory enough to warrant repetition.

A large aquarium mounted on an iron stand was wheeled up to a north window and a frame of thin boards built into the window casing in such a way as to

[1] *American Biological Teacher.* April, 1940. Volume 2. Number 7, Pp. 175–178.

[2] College Biological Supply Company.

expose the glass of one side to the open air without letting wind blow into the room. This keeps the water cooler than room temperature. A good aerating pump with an air breaker that sends a constant stream of fine bubbles into the water is a necessity.

A shipment of 20 gallons of sea water preceded the box of animals and seaweed by a few days. We have not tried to have fish or jelly fishes sent but there is a wide variety of seashore invertebrates available, many of which will stand the trip very well. Our first shipment came in freezing weather and when I went for it to the express office I found it close to the stove where it had been placed with well-meant care! Our first successful shipment came on November 5, 1947. It contained a great wealth of material including a mass of feather-duster worms in tubes, a starfish, a sand dollar, and a clump of mussels. None of these lived more than a week in their new quarters and we had to pick out dead worms every day but luck was better with most things.

Several sea anemones spread their tentacles ready for any food we offered them, barnacles performed regularly, limpets, chitons and snails were always crawling about while crabs and hermit crabs seemed quite at home.

Most of the sea weeds soon disappeared, probably eaten by the crabs, but smaller forms of algae soon clouded the glass and festooned the aerator tube. Under the microscope these proved to be supporting a rich protozoan fauna including sessile ciliates on branching stems, e.g. Carchesium.

During the winter the population gradually declined but enough remained to maintain interest. A clam, several hermit crabs, some tunicates and a chiton lived till spring and when I cleaned out the aquarium and shut off the aerator in June, I found two sea anemones, a limpet and three crabs still living. Curiously enough after the heat and neglect of the summer, a single inch-long annelid was found alive in the sand in the fall.

Books

SALLE, A. P. *Fundamental Principles of Bacteriology.* New Third Edition. McGraw-Hill Book Company, New York. 730 pp. illus. 1948.

In the latest revision of this famous text, Dr. Salle has subjected every chapter to close scrutiny and has brought the material up-to-date. It is especially designed for the beginning student since the fundamentals of bacteria have been stressed, but it is also an aid for the more advanced student who is in need of a good reference. Great emphasis has been placed upon the chemistry of bacteria. There are exceptionally good chapters on nutrition, enzymes, and respiration which explain in detail their chemical reactions, with many structural formulas.

The classification of the bacteria is based as far as possible on the sixth edition of Bergey's *Manual of Determinative Bacteriology.* The value of this book is enhanced by the addition of a large number of illustrations, some of which are prints of pictures taken by the electron microscope. A glossary of terms used on the descriptive chart is placed at the end of the chapter on Technique of Pure Cultures. A comprehensive index is included; also, a complete list of references at the end of each chapter.

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Yeast Experiments for the High School Student

DONALD S. LACROIX
Amherst High School, Amherst, Massachusetts

Fermentation.

To demonstrate fermentation by yeast, mix a solution of molasses and water (1 to 10) and completely fill the upper arm of each of two fermentation tubes. Introduce a piece of yeast cake half the size of a pea into one of the tubes. Set aside at room temperature for a few hours or over night. Within an hour small bubbles should begin to collect in the top of the fermentation tube containing yeast, and by morning, the molasses solution should be completely driven out of the upper arm into the reservoir below (Fig. 1) all due to the fact that yeast in fermentating, gives off CO_2 gas. The gas rises and forces the molasses solution out. Alcohol, of course, is a product of this activity and its presence can be detected by its odor. No such changes should take place in the control.

Figure 1. Left: at the beginning of the experiment; right: after an interval depending on room temperature the gas resulting from the fermentation process has collected in the closed arm of the fermentation tube.

To demonstrate that CO_2 is produced, fill a bottle with 500cc. of molasses solution mentioned above and add half of a yeast cake. Close the mouth of the bottle with a one-hole stopper through which extends a tube bent as shown in Figure 2. The other end should be submerged in a test tube of lime water. At room temperature, CO_2 should be given off in quantities sufficient to bubble through the lime water and make it become quite turbid.

Figure 2. Gas forced through the glass tube will bubble through the limewater in the test tube and cause a milky deposit.

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Smear a drop of yeast suspension from one of the fermenting solutions mentioned above on a microscope slide; cover with cover slip and examine under high power. By running a drop of iodine solution under the cover slip, temporary staining will result.

To prepare a permanent mount, dilute a drop of the yeast solution with two of distilled water and smear thinly on a microscope slide. Allow to air dry. Fix by passing through a Bunsen flame a couple of times. Flood with methylene blue stain for 2 minutes. Rinse with distilled water; dry; cover with balsam and a cover slip.

Spore formation.

Chamberlain in *Methods in Plant Histology* recommends that "a cake of Fleischmann's yeast be put in a mixture of equal parts of grape juice and distilled water with 1 gram of peptone. Allow to bud freely over night at 30°C. Place material in a plaster-of-Paris cup with a depression, and put the cup in a small Stender dish with water coming nearly to the top of the cup. In 60–70 hours there should be abundant spore formation."

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tion. H. O. Burdick is the chairman of the Department of Biology of the College of Liberal Arts of Alfred University and Acting Dean of the College. His field of research is Endocrinology and he was the Field Director of the American Red Cross in India during World War II. He is well known for his activities in the field of health education.

Two other papers presented at the Washington Meeting, *The Role of the Health Coordinator* by Morey R. Fields, and *Social Hygiene in Education for Family Life,* by Ray H. Everett, will be printed in the April and May issues.

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Articles are scheduled for publication in approximately the order of acceptance of the manuscripts. Generally the journal is tentatively arranged about three or four issues ahead, and there are under consideration at any time enough manuscripts for about two or three more issues. Some space is of course allowed for news items and articles of a seasonal nature. On the average, a manuscript submitted this month may expect to find its way into print, if it is accepted promptly, in about October or November. Many seasonal papers have to be postponed an entire year, simply because the author has not allowed the necessary four to six months that intervenes between acceptance and publication.

For details concerning titling, headings, references, illustrations, etc., consult *Preparation of Manuscripts for Publication,* which appeared in the October, 1943, issue of THE AMERICAN BIOLOGY TEACHER. A limited number of reprints is still available; copies may be obtained from the editor.

Manuscripts may be sent to the editor-in-chief or to any one of the associate editors. A complete list of the latter appears in each October and February issue.

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